THE ALBION IMPACTOCLASTIC BRECCIA (ALBION DIAMICTITE BED): CUMULATIVE GRAIN-SIZE FREQUENCY CURVES AND POSSIBLE MODES OF EMPLACEMENT. D. T. King, Jr.[1], L. W. Petruny[2], K. O. Pope[3], and A. C. Ocampo[4], [1]Dept. Geology, Auburn University, Auburn, AL 36849-5305 [kingdat@auburn.edu], [2]Astra-Terra Research, Auburn, AL 36831-3323 [lpetruny@att.net], [3]Geo Eco Arc Research, 16305 St. Mary's Church Road, Aquasco, MD 20608 [kpope@starband.net], [4]ESTEC Planetary Division, European Space Agency, SCI-SB, Keplerlann 1, Noordwijk, The Netherlands [Adriana.Ocampo@rssd.esa.int].

The Albion impactoclastic breccia [1] (named the Albion diamictite bed by [2]) in Albion Island, Belize (Figure 1), and nearby areas in Quintana Roo, México, is a very coarse, carbonate clast-rich unit that was formed by ballistic sedimentation and ejecta debris-flow processes in the aftermath of the Chicxulub impact event on the Yucatán Peninsula of México. The Albion impactoclastic breccia is a parabreccia (*sensu* [3]), meaning that if the matrix could be removed the remaining clasts would collapse.

The Albion impactoclastic breccia (~15 m) is underlain by a ~ 1-2 m-thick, fine-grained impactoclastic unit containing accretionary lapilli and clay clasts (named the Albion spheroid bed by [2]; Figure 2)). This finer grained unit underlies the breccia and together these two impactoclastic units comprise a mappable, unconformity-bounded stratigraphic interval between upper Maastrichtian dolostones and lower Tertiary thin-bedded limestones in the study area [2].

In-situ, apparent-diameter measurements of clasts within the Albion impactoclastic breccia were combined with thin-section analyses of matrix samples and photographic percent-area measurements of course boulders and fine blocks to obtain cumulative grain-size frequency curves (Figure 3) for different stratigraphic levels within the impactoclastic breccia. There is a general fining upward trend among stratigraphic levels studied at Albion Island [4].

Albion impactoclastic breccias are generally extremely poorly sorted and have very high matrix content (< 1 cm or < -3.5 phi), which ranges from 60 to 85 percent. The mean size of stratigraphic levels either falls within the matrix (< 1 cm or < -3.5 phi) or is less than 5 cm (~ -5.6 phi. Where present, rather rare coarse boulders and fine blocks (i.e., size range 1 to 9 m or -10 to -13.3 phi) tend to strongly affect mean size. There is a dearth of observed grain sizes of clasts in the impactoclastic breccia for sizes between 30 cm and 1 m (-8.5 and -10 phi). There is a strong statistical indication of mixing of at least two distinct size populations within this impactoclastic breccia.

Intensive comminution of grains, surface markings showing violent grain interactions, coated grains, and internal fracturing of clasts are evidence of early turbulent interaction among debris in the collapsing Chicxulub ejecta curtain. However, flow laminations and flow-produced pseudo-bedding contacts, aligned platy clasts, and intact highly fractured clasts (i.e., clasts with jigsaw cracks) are evidence of subsequent, laminar or more regular flow conditions within the impactoclastic breccia.

One possible explanation for the two clast populations and observed flow characteristics involves mixing of ballistically transported (allochthonous) sedimentary material with locally derived (autothonous) boulders and blocks derived from secondary cratering. Alternatively, the mixing may derive from ejecta curtain interaction with the atmosphere and subsequent sorting of clasts into distinct flows that mix in the latter stages of deposition [5].

References: [1] Terminology of Stöffler D. and Grieve R. A. F. (1994) *LPS XXV,* 1347–1348. [2] Ocampo A. C. et al. (1996) *Geol. Soc. Amer. Spec. Paper 307,* 75-88. [3] Concept of Prothro D. R. and Schwab F. (1996) *Sedimentary geology*. [4] King, Jr. D. T. and Petruny L. W. (2001) *ESF Impact (Granada) mtg. abstracts,* 65-66. [5] Pope, K.O. et al. (1999) *Earth Planet. Sci. Let., 170,* 351-364.

Figure 1. Location of Albion Quarry, Belize.

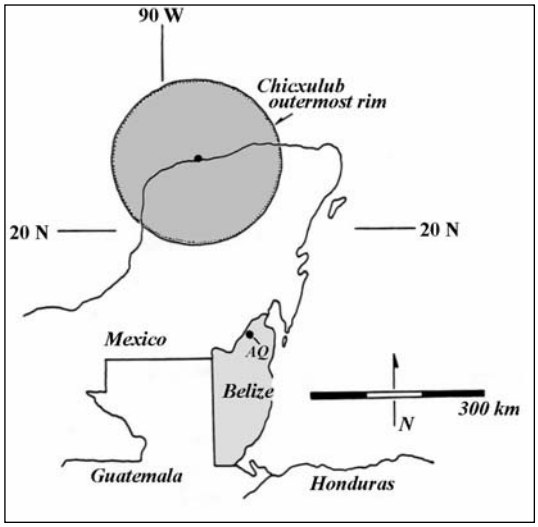

Figure 2. Albion Quarry, Albion Island, Belize. Person stands at base of section: spheroid and diamictite beds are indicated. Boulders and blocks are circled.

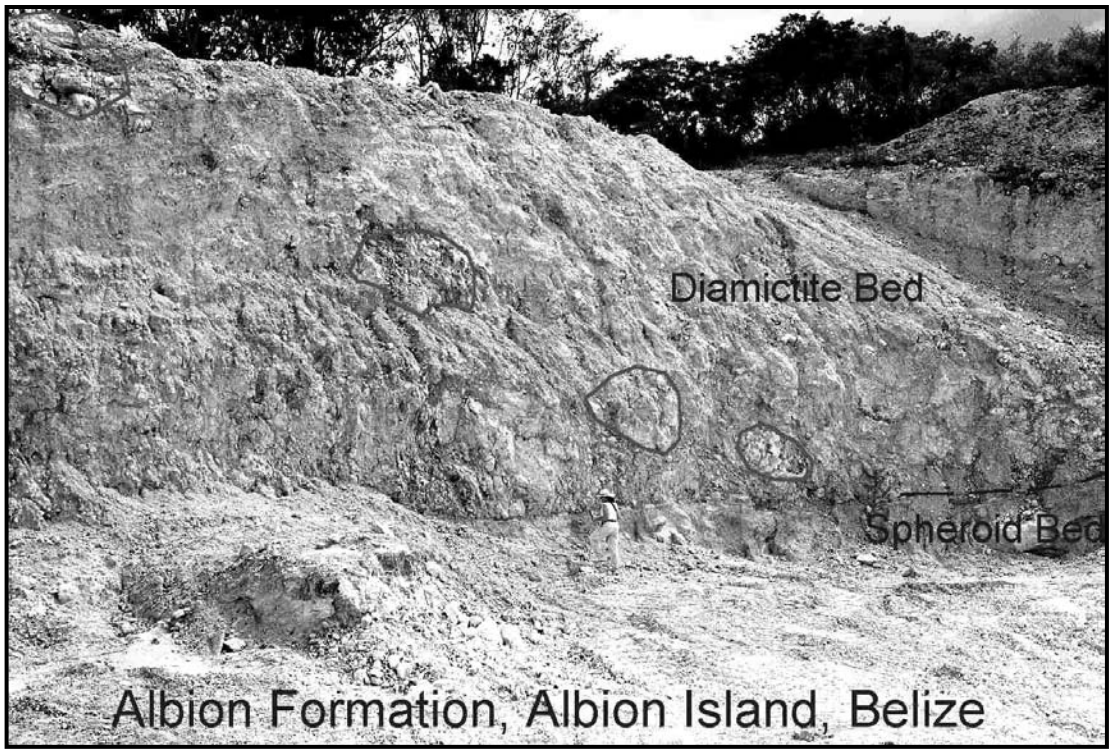

Figure 3. Typical grain-size frequency curve for the Albion impactoclastic breccia.